

## FIN325 - Homework 4

Due : March 5th

### Problem 1 (30pts)

A corporation is about to invest in two projects whose random payoffs are described by the following table, where the ?'s are numbers I ask you to discover below.

$S$	$s_1$	$s_2$	$s_3$
$p$	0.25	0.50	0.25
$X$	90	100	110
$Y$	?	?	?

1. Find three possible values for the missing numbers so that  $Y$  has a correlation of 0.5 with  $X$  and a variance of 50.
2. The corporation wants to split its investment funds across the two projects so as to make the variance of the resulting payoff as small as possible. What is the variance of the resulting portfolio?

### Problem 2 (30pts)

Run a 3-factor Fama-French regression for a corporation of your choice for which 5 years of monthly adjusted return data are available. Name and describe the corporation in one sentence. Then report the corporation's alpha and three betas according to your regression. Which of those are significant? (Report the statistic you are using to make that determination.)

(*Bonus assignment worth 5 points:* Run your regression using either R, Python, Matlab, Stata, Sas, or Julia. To qualify for these bonus points, you must turn in the script you used to run the regression, and its output.)

### Problem 3 (20pts)

Consider the following probability space and random variables.

$S$	$s_1$	$s_2$	$s_3$
$P$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
$r_m$	0.30	0.20	0.10
$r_F$	0.15	0.15	0.15

Here,  $r_m$  is the return on the market portfolio,  $r_F$  is the risk-free return. Assume that CAPM holds exactly. Consider an asset whose return  $r_i$  has covariance 0.02 with  $r_m$ . What is the expected value of  $r_i$ ?

**Problem 4 (20pts)**

Consider a financial economy with three assets. The (percentage terms) expected returns of assets 1, 2, and 3 are (11, 20, 12), respectively. The variance-covariance matrix of these returns (also in percentage terms) is:

$$\begin{bmatrix} 300 & 150 & 0 \\ 150 & 1000 & 0 \\ 0 & 0 & 200 \end{bmatrix}.$$

1. Assume that the investor splits her wealth equally across the three assets. What is the expected return of this portfolio and what is the variance of this return?
2. Which portfolio has the highest variance in this economy, assuming no short sales?